

## PATENT ABSTRACTS OF JAPAN

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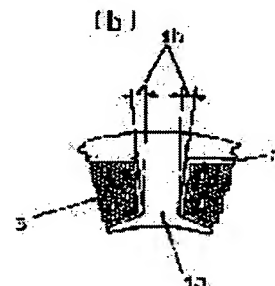
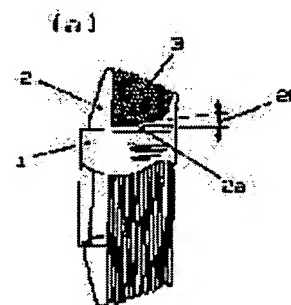
MORITA KAZUNORI

(54) STATOR OF MOTOR PROVIDED WITH INNER ROTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To attain a stator at a low cost which is capable of stable winding with high density, by forming a slope with its thickness becoming larger from its outer periphery side toward its inner periphery side at the polar tooth face of an end insulator.

SOLUTION: An electric wire 3 is wound sequentially from the outer periphery to the inner periphery of an end insulator 2, or from the larger width side to the smaller width side of a polar tooth part 2a so as to be orthogonal to the polar tooth part. A slope 2b corresponding to a slope 1b which a polar tooth part 1a owns is formed at the end insulator 2. In the slope 1b of the polar tooth part 1a of a layered iron core 1 and the slope 2b of the end insulator 2, the slope 2b is formed so as to be a little larger than the slope 1b. As a result, stable load occurs from the outer periphery to the inner periphery of the end insulator 2. Therefore, the wire 3 can be wound around in a close contact condition without sliding on the sloped part of the end insulator 2 for aligned winding, thus possible to form stable winding.



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CLAIMS

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[Claim(s)]

[Claim 1] the stator of the inner rotor mold motor which be equip with the layer-built iron core which carried out the laminating of the silicon steel , the electric wire looped around for every pole gear unit of said layer-built iron core , and the end insulator with which it be locate in the both ends of the direction of a laminating of said layer-built iron core , and the bonnet aforementioned electric wire and said layer-built iron core be insulate for the pole gear section , and be characterize by to establish the inclination which become thick towards an inner circumference side from a periphery side on the top face of the both ends of said layer-built iron core at said end insulator .

[Claim 2] The stator of the inner rotor mold motor according to claim 1 which made equivalent inclination the inclination of a layer-built iron core and the inclination of an end insulator which have the inclination which becomes narrow towards an inner circumference side from the periphery side at the pole gear section.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the stator of an inner rotor mold motor, especially the improvement in a coil consistency.

[0002]

[Description of the Prior Art] In recent years, a servo motor is used abundantly at the driving source of various industrial devices, a miniaturization and high performance-ization (high responsibility) are called for, for this reason, the coil consistency of a stator is raised, inertia is further made small by using the magnet of high flux density for the Rota magnet, and a miniaturization and high performance-ization are supported.

[0003] After dividing and insulating and looping a circumferential direction around an electric wire to the approach of raising the above-mentioned coil consistency for every pole gear which constitutes a stator, there is the manufacture approach which joins the amount of predetermined numbers annularly and forms a stator.

[0004] Hereafter, the conventional stator is explained using a drawing. In drawing 2, the end insulator which equipped the circumferential direction with 21 for every pole gear unit, and equipped the both ends of a layer-built iron core 21 with division, the layer-built iron core which carried out the laminating, and 22, the electric wire looped around as crossed at right angles in the pole gear section 24 of a layer-built iron core 21 and 23 through the end insulator 22, and 25 are layer-built iron core piece finished products. And as shown in drawing 3, this layer-built iron core piece finished product 25 is arranged in the amount of predetermined numbers annular, welds the division joint 26 of a layer-built iron core 21, respectively, and serves as a stator.

[0005]

[Problem(s) to be Solved by the Invention] However, there were the following troubles with the above-mentioned conventional configuration.

[0006] In drawing 2 (b), while an electric wire tended to slide on an inner circumference side and applied the traverse to the electric wire with the winding machine, even if it carried out the coil according to the inclination of the slot section of the pole gear section 24 of a layer-built iron core 21, the conditioning for carrying out alignment looping around was difficult, and it was difficult to be stabilized and to acquire the coil condition of high density.

[0007] If the crevice according to the wire size of the electric wire 23 to loop around is formed in the top face or side face of the pole gear section 24 of insulator 22c like drawing 2 (c) as this cure, even if it does not apply a traverse, since an electric wire is looped around along the crevice of end insulator 22c, sliding according to the inclination of the slot section will be lost, and alignment looping around will be attained.

[0008] However, by the approach of forming the crevice according to the wire size of the electric wire which the electric wire of a wire size with which versatility differs corresponding to input voltage or an output torque is used, and loops the pole gear section 24 of insulator 22c around the coil specification of a motor, the end insulator according to each wire size is needed.

[0009] Moreover, if a crevice tends to be formed and it is going to maintain both sides of an insulation and reinforcement, the slot cross section of the pole gear section to which it is necessary to carry out thickness of insulator 22c thickly, consequently an electric wire is restored will become small, and will become the factor which checks a high density coil.

[0010] This invention solves the above-mentioned conventional technical problem, and aims at offering cheaply the stator in which the high-density and stabilized coil is possible.

[0011]

[Means for Solving the Problem] In order to solve this technical problem, this invention is equipped with the layer-

built iron core which carried out the laminating of the silicon steel, the electric wire looped around for every pole gear unit of said layer-built iron core, and the end insulator with which it is located in the both ends of the direction of a laminating of said layer-built iron core, and the bonnet aforementioned electric wire and said layer-built iron core are insulated for the pole gear section, and prepares the inclination which becomes thick towards an inner circumference side in said end insulator from a periphery side on the top face of the both ends of said layer-built iron core.

[0012]

[Embodiment of the Invention] The layer-built iron core where this invention carried out the laminating of the silicon steel in order to solve this technical problem, It has the electric wire looped around for every pole gear unit of said layer-built iron core, and the end insulator with which it is located in the both ends of the direction of a laminating of said layer-built iron core, and the bonnet aforementioned electric wire and said layer-built iron core are insulated for the pole gear section. It is the stator of the inner rotor mold motor characterized by establishing the inclination which becomes thick towards an inner circumference side from a periphery side on the top face of the both ends of said layer-built iron core at said end insulator.

[0013] Moreover, it is the stator of the inner rotor mold motor according to claim 1 which made equivalent inclination the inclination of a layer-built iron core and the inclination of an end insulator which have the inclination which becomes narrow towards an inner circumference side from the periphery side at the pole gear section.

[0014] Thus, since the inclination which turns the pole gear section top face of an end insulator to an inner circumference side from a periphery side, and becomes thick was established, even if it does not apply a traverse to an electric wire with a winding machine, on an electric wire, the force in which it slides towards the periphery side of the pole gear section occurs, and it becomes easy to carry out alignment looping around.

[0015] Moreover, the force in which it slides towards the periphery side of the pole gear section generated with the inclination of an insulator what made equivalent inclination the inclination of an insulator and the inclination of the pole gear section as opposed to the force which an electric wire tends to slide down into an inner circumference section side according to the inclination of the pole gear section when inclination is in the pole gear section of a layer-built iron core overcomes, and it becomes easy to carry out alignment looping around.

[0016]

[Example] Hereafter, the example of this invention is explained, referring to a drawing.

[0017] In drawing 1 , the end insulator which equipped the circumferencial direction with 1 for every pole gear unit, and equipped the both ends of a layer-built iron core 1 with division, the layer-built iron core which carried out the laminating, and 2, the electric wire looped around as crossed at right angles in pole gear section 1a of a layer-built iron core 1 and 3 through the end insulator 2, and 5 are layer-built iron core piece finished products. The inclination and 2a in which pole gear section 1a has 1b are the pole gear section of the end insulator 2, and 2b is the inclination prepared in the pole gear section 2a top face.

[0018] It winds and an electric wire 3 is looped around so that it may intersect perpendicularly with the pole gear section from the periphery side of the end insulator 2 one by one to the narrower one from the one where the width of face by the side of inner circumference (i.e., pole gear section 2a) is wider.

[0019] Since inclination 2b which is equivalent to inclination 1b which pole gear section 1a has at this time was prepared in the end insulator 2, on an electric wire 3, the load stabilized in the inner circumference side direction from the periphery side of an insulator 2 is generated. For this reason, it is wound where an electric wire 3 is stuck without sliding on the inclination section of the end insulator 2, and formation of the coil stabilized since alignment looping around was carried out is attained.

[0020] In addition, when parallel, even if pole gear section 1a of a layer-built iron core 1 prepares the relation between inclination 1b of pole gear section 1a of a layer-built iron core 1, and inclination 2b of the end insulator 2, it is [ that what is necessary is just to make inclination 2b into extent (equivalent inclination) made somewhat larger than inclination 1b ] effective.

[0021]

[Effect of the Invention] According to this invention, the pole gear aspect of an insulator can be made to generate the force of the sense stabilized on the electric wire wound from a periphery side only by establishing the inclination which becomes thick towards an inner circumference side so that clearly from the above-mentioned example.

[0022] When inclination is in the pole gear section of a layer-built iron core especially, the force of the sense stabilized on the electric wire wound only by preparing equivalent, somewhat larger inclination than the inclination of the pole gear section of a layer-built iron core in an end insulator can be generated, and sliding down of an electric wire in accordance with the inclination of the pole gear section of a layer-built iron core is lost.

[0023] Alignment looping around which electric wires stuck by this can be obtained cheaply.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] (a) The fragmentary sectional view of the layer-built iron core piece finished product of the example of this invention

(b) The sectional view of the coil section of the example of this invention

[Drawing 2] (a) The fragmentary sectional view of the conventional layer-built iron core piece finished product

(b) The sectional view of the conventional coil section

(c) The plan of the conventional high density coil and an insulator

[Drawing 3] The flat-surface sectional view of a stator

[Description of Notations]

1 Layer-built Iron Core

1a Pole gear section

1b Inclination

2 And Insulator

2b Inclination

3 Electric Wire

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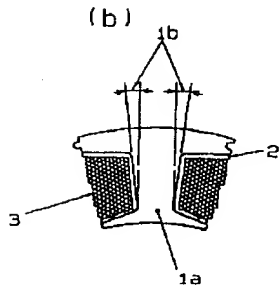
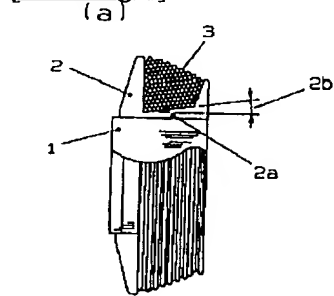
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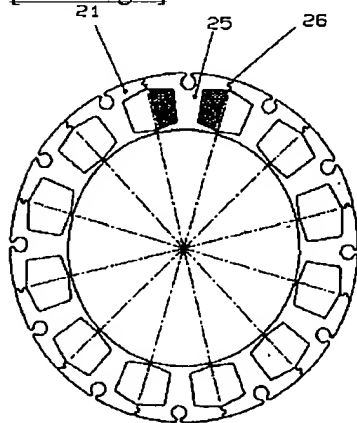
DRAWINGS

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[Drawing 1]

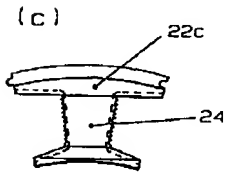
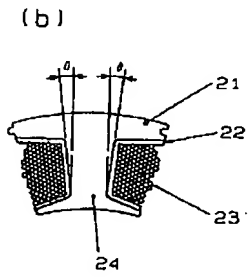
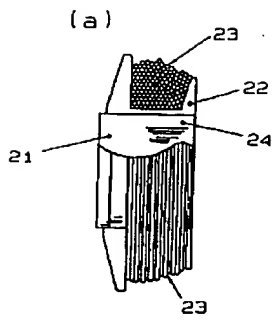


[Drawing 3]



[Drawing 2]





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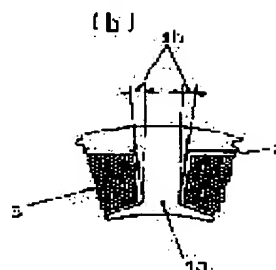
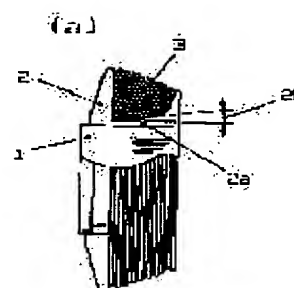
(72)Inventor : TSUTSUI MASARU  
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**PROBLEM TO BE SOLVED:** To attain a stator at a low cost which is capable of stable winding with high density, by forming a slope with its thickness becoming larger from its outer periphery side toward its inner periphery side at the polar tooth face of an end insulator.

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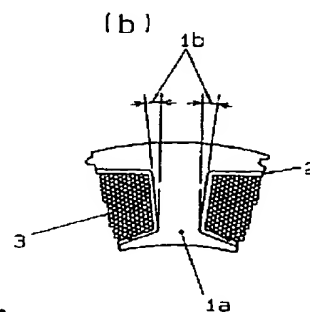
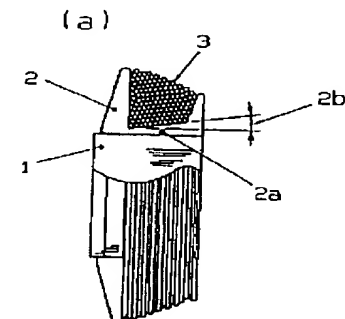
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(54)【発明の名称】 インナーロータ型モータの固定子

(57)【要約】

【課題】 高密度で安定した巻線が可能な固定子を安価に提供することを目的とする。

【解決手段】 積層鉄心 1 の積層方向の両端部に位置して極歯部 1 a を覆い、電線 3 と積層鉄心 1 とを絶縁するエンドインシュレータ 2 に、積層鉄心 1 の両端部の上面に外周側から内周側に向けて厚くなる勾配 2 b を設けた固定子である。



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## 【特許請求の範囲】

【請求項 1】珪素鋼板を積層した積層鉄心と、前記積層鉄心の極歯単位毎に巻装した電線と、前記積層鉄心の積層方向の両端部に位置して極歯部を覆い前記電線と前記積層鉄心とを絶縁するエンドインシュレータとを備え、前記エンドインシュレータに、前記積層鉄心の両端部の上面に外周側から内周側に向けて厚くなる勾配を設けたことを特徴とするインナーロータ型モータの固定子。

【請求項 2】極歯部に外周側から内周側に向けて狭くなる勾配を有する積層鉄心の勾配とエンドインシュレータの勾配とを同等の勾配にした請求項 1 記載のインナーロータ型モータの固定子。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明はインナーロータ型モータの固定子、特に巻線密度向上に関するものである。

【0002】

【従来の技術】近年、各種産業用機器の駆動源にサーボモータが多用され、小型化・高性能化（高応答性）が求められており、このため、固定子の巻線密度を高め、さらに、ロータマグネットに高磁束密度の磁石を用いることでイナーシャを小さくして、小型化・高性能化に対応している。

【0003】上記の巻線密度を高める方法に、固定子を構成する極歯毎に円周方向に分割・絶縁し、電線を巻装した後、所定数量を環状に接合して固定子を形成する製造方法がある。

【0004】以下、従来の固定子について、図面を用いて説明する。図 2 において、21 は極歯単位毎に円周方向に分割・積層した積層鉄心、22 は積層鉄心 21 の両端部に装着したエンドインシュレータ、23 はエンドインシュレータ 22 を介して積層鉄心 21 の極歯部 24 に直交するように巻装した電線、25 は積層鉄心片完成品である。そして、図 3 に示すように、この積層鉄心片完成品 25 は所定数量環状に配設され、積層鉄心 21 の分割接合部 26 をそれぞれ溶接して固定子となる。

【0005】

【発明が解決しようとする課題】しかしながら、上記従来の構成では、以下のような問題点があった。

【0006】図 2 (b) においては、積層鉄心 21 の極歯部 24 のスロット部の勾配によって、電線が内周側に滑り易く、巻線機にて電線にトラバースをかけながら巻線をして、整列巻装するための条件設定が難しく、安定して高密度の巻線状態を得ることが難しかった。

【0007】この対策として、図 2 (c) のように、エンドインシュレータ 22 c の極歯部 24 の上面又は側面に、巻装する電線 23 の線径に応じた凹部を形成すれば、トラバースをかけなくても電線はエンドインシュレータ 22 c の凹部に沿って巻装されるので、スロット部の勾配によって滑ることがなくなり、整列巻装が可能に

なる。

【0008】しかしながら、モータの巻線仕様は、入力電圧や出力トルクに対応して種々の異なる線径の電線が使用されており、エンドインシュレータ 22 c の極歯部 24 に巻装する電線の線径に応じた凹部を形成する方法では、個々の線径に応じたエンドインシュレータが必要になる。

【0009】また、凹部を形成して絶縁と強度の両面を維持しようとする、エンドインシュレータ 22 c の肉厚を厚くする必要があり、その結果、電線が納まる極歯部のスロット断面積が小さくなり高密度巻線を阻害する要因になる。

【0010】本発明は、上記従来の課題を解決するものであり、高密度で安定した巻線が可能な固定子を安価に提供することを目的とする。

【0011】

【課題を解決するための手段】この課題を解決するために本発明は、珪素鋼板を積層した積層鉄心と、前記積層鉄心の極歯単位毎に巻装した電線と、前記積層鉄心の積層方向の両端部に位置して極歯部を覆い前記電線と前記積層鉄心とを絶縁するエンドインシュレータとを備え、前記エンドインシュレータに、前記積層鉄心の両端部の上面に外周側から内周側に向けて厚くなる勾配を設けたものである。

【0012】

【発明の実施の形態】この課題を解決するために本発明は、珪素鋼板を積層した積層鉄心と、前記積層鉄心の極歯単位毎に巻装した電線と、前記積層鉄心の積層方向の両端部に位置して極歯部を覆い前記電線と前記積層鉄心とを絶縁するエンドインシュレータとを備え、前記エンドインシュレータに、前記積層鉄心の両端部の上面に外周側から内周側に向けて厚くなる勾配を設けたことを特徴とするインナーロータ型モータの固定子である。

【0013】また、極歯部に外周側から内周側に向けて狭くなる勾配を有する積層鉄心の勾配とエンドインシュレータの勾配とを同等の勾配にした請求項 1 記載のインナーロータ型モータの固定子である。

【0014】このように、エンドインシュレータの極歯部上面を、外周側から内周側に向けて厚くなる勾配を設けたので、巻線機により電線にトラバースをかけなくても、電線には極歯部の外周側に向けて滑ろうとする力が発生して、整列巻装がしやすくなる。

【0015】また、積層鉄心の極歯部に勾配があるときに、エンドインシュレータの勾配と極歯部の勾配とを同等の勾配にしたものでは、極歯部の勾配により電線が内周部側に滑り落ちようとする力に対して、エンドインシュレータの勾配で発生する極歯部の外周側に向けて滑ろうとする力が打ち勝って、整列巻装がしやすくなる。

【0016】

【実施例】以下、本発明の実施例を図面を参照しながら

説明する。

【0017】図1において、1は極歯単位毎に円周方向に分割・積層した積層鉄心、2は積層鉄心1の両端部に装着したエンドインシュレータ、3はエンドインシュレータ2を介して積層鉄心1の極歯部1aに直交するように巻装した電線、5は積層鉄心片完成品である。1bは極歯部1aが有する勾配、2aはエンドインシュレータ2の極歯部で、2bは極歯部2a上面に設けた勾配である。

【0018】電線3はエンドインシュレータ2の外周側から内周側に、つまり極歯部2aの幅の広い方から狭い方へ順次、極歯部に直交するように巻回して巻装される。

【0019】このとき、極歯部1aが有する勾配1bに相当する勾配2bをエンドインシュレータ2に設けたので、電線3にはエンドインシュレータ2の外周側から内周側方向に安定した負荷が発生する。このため電線3はエンドインシュレータ2の勾配部を滑らずに密着した状態で巻回され、整列巻装できるので安定した巻線の形成が可能になる。

【0020】なお、積層鉄心1の極歯部1aの勾配1bとエンドインシュレータ2の勾配2bの関係は、勾配2bを勾配1bより少し大きくする程度（同等の勾配）にすればよく、また、積層鉄心1の極歯部1aが平行な場合に設けても有効である。

【0021】

【発明の効果】上記の実施例から明らかなように本発明によれば、エンドインシュレータの極歯部面に外周側か

ら内周側に向けて厚くなる勾配を設けるだけで、巻回される電線に安定した向きの力を発生させることができる。

【0022】特に、積層鉄心の極歯部に勾配がある場合に、積層鉄心の極歯部の勾配より少し大きい同等の勾配をエンドインシュレータに設けるだけで、巻回される電線に安定した向きの力を発生させることができ、電線は積層鉄心の極歯部の勾配に沿って滑りおちることがなくなる。

【0023】これにより電線どうしが密着した整列巻装を安価に得ることができる。

【図面の簡単な説明】

【図1】(a) 本発明の実施例の積層鉄心片完成品の部分断面図

(b) 本発明の実施例の巻線部の断面図

【図2】(a) 従来の積層鉄心片完成品の部分断面図

(b) 従来の巻線部の断面図

(c) 従来の高密度巻線のエンドインシュレータの上面図

20 【図3】固定子の平面断面図

【符号の説明】

1 積層鉄心

1a 極歯部

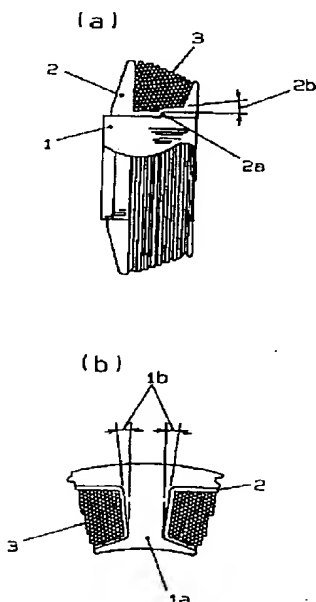
1b 勾配

2 エンドインシュレータ

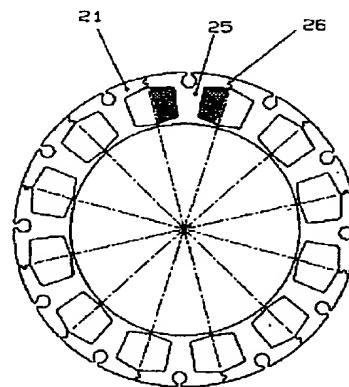
2b 勾配

3 電線

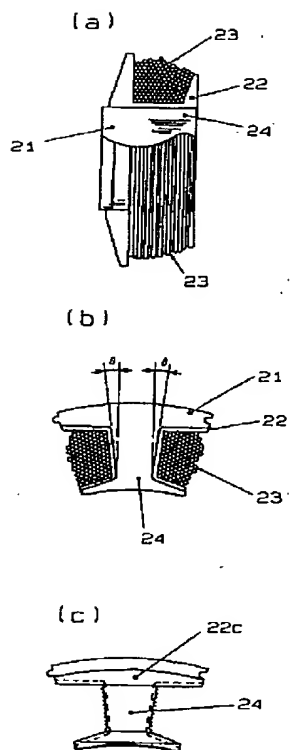
【図1】



【図3】



【図2】



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フロントページの続き

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